STUDENT WORKSHEET

Unit 1: Lesson 4 – Defending Our DNA: How Cells Protect Against Foreign Genetic Material

Part 1 — Key Vocabulary

As we review the defense maps together, fill in the blanks below.

Term	Definition (fill in the blanks)
Nuclease	An enzyme that cuts up (breaks down) _____, destroying it into harmless fragments.
DNase	A specific type of nuclease that breaks down _____. These operate _____ the cell (in blood and tissues).
Lipid bilayer	The structure of the _____ _____. Because DNA cannot freely cross it, it acts as a physical barrier.
Nuclear envelope	The double membrane that surrounds the _____, keeping the host's own DNA compartmentalized and protected.
Nuclear pore complex	Gateways in the nuclear envelope that _____ what is allowed to enter and exit the nucleus.
Integrase	Specialized viral machinery (found in retroviruses like _____) designed to _____ viral genetic material into the host genome. Random DNA fragments do NOT have this.

Part 2 — Connecting to Prior Lessons

Connection to Lesson 1 — Organs and Tissues

Where in the body do the extracellular defenses (DNases) operate?

How do organs like the spleen and lymph nodes help clear foreign material from the body?

Connection to Lesson 2 — Innate Immune System

The extracellular nucleases and the cell's structural barriers (membrane, nuclear envelope) are part of the innate, *non-specific* defense system. *How does this compare to the "castle" model from Lesson 2? What are the "walls" against foreign DNA?*

Connection to Lesson 3 — Adaptive Immune System

If a pathogen (such as a virus), which includes foreign DNA and proteins, infects a cell, how does the adaptive immune system respond? How do T cells and B cells target cells compromised by a pathogen?

The critical distinction: Fill in the blanks

Foreign DNA fragments from food, bacteria, or vaccines are fundamentally _____ from the DNA of an actively infecting virus.

• A virus carries specialized molecular machinery, such as _____ enzymes in retroviruses like HIV (Unit 2, Lesson 2) designed to insert its genetic material into the host genome.

• Random DNA fragments lack this machinery _____.

• Even retroviruses must overcome _____ cellular defenses to succeed.

Big idea — in your own words:
Why is a random foreign DNA fragment so different from an actively infecting virus, and why does this make it nearly impossible for the food you eat to change your DNA?

Summary Table – In the space below, create a summary table identifying each defense mechanism, its location, how it works, and its connection to prior lessons.